CLAIMS

1. A threaded tubular connection for a tubular string which is subjected to dynamic bending loads, comprising a male tubular element (1) provided with a male threaded portion (3) and a female tubular element (2) provided with a female threaded portion (4), characterized in that it comprises at least one transfer zone axially disposed between said threaded portions and the free end of one of said tubular elements, while being axially spaced from said threaded portions (3, 4) so as to transfer a fraction of at least 20%, preferably at least 30% of the bending moment to which the connection is subjected from one element to the other, the male and female elements (1, 2) having respective transfer surfaces (5, 6) in mutual contact with a radial interference fit in said transfer zone, at least one of the transfer surfaces being an undulated surface (5) defining a series of annular rounded ribs (7) which come into interfering contact with the facing transfer surface (6), the points (P_M, P_m) of maximum diameter and minimum diameter of the undulation profile being located on respective rounded portions (A1, A2) of the profile.
2. A threaded connection according to claim 1, in which said free end of one of the tubular elements has a front surface which is free of contact with the other tubular element.
3. 3 A threaded connection according to claim 1 or claim 2, in which the axial length of the transfer zone is selected so as to limit the contact pressure resulting from transferring the bending moment to a fraction of the yield strength of the material which is less than 1 and preferably less than 0.5.
4. A threaded connection according to one of the preceding claims, in which said male and female transfer surfaces (5, 6) are lubricated.
5. 5. A threaded connection according to one of the preceding claims, in which said facing transfer surface (6) is a smooth surface.
6. 6. A threaded connection according to claim 5, in which said undulated surface (5) is out of contact with said smooth surface between said ribs.
7. 7. A threaded connection according to one of the preceding claims, in which the two transfer surfaces are undulated surfaces.
8. A threaded connection according to claim 7, in which the ribs of a transfer surface are housed between the ribs of the facing transfer surface.
9. A threaded connection according to one of the preceding claims, in which said undulated surface or surfaces (5) has/have a periodic profile.
10. A threaded connection according to claim 9, in which said periodic profile is asymmetric.
11. A threaded connection according to one of the preceding claims, in which said profile forms part of the male transfer surface and is defined by a first convex rounded portion (A1) containing a point (P_M) with a maximum profile diameter, by

a second concave rounded portion (A2) containing a point (P_m) with a minimum profile diameter and which is tangential to the first rounded portion, and by a third convex rounded portion (A3) which is tangential to the first and second rounded portions and which has a radius (R3) which is substantially larger thereof.

12. A threaded connection according to claim 11, in which the second rounded portion has a larger radius (R2) than the first rounded portion.

13. A threaded connection according to one of claims 11 and 12, in which starting from the free end of the male element, the axial distance (d1) between a maximum profile diameter point (P_M) and the following minimum diameter point (P_m) of the profile is less than the axial distance (d2) between a minimum profile diameter point and the following maximum diameter point (P'_M) of the profile.

14. A threaded connection according to claim 13, in which the third rounded portion is located between a minimum profile diameter point (P_m) and the following maximum diameter point (P'_M) of the profile.

15. A threaded connection according to one of the preceding claims, in which the radii (R1, R2) of said rounded portions (A1, A2) containing the points (P_M, Pm) of maximum diameter and of minimum diameter of the profile are at least equal to 0.4 mm.

16. A threaded connection according to one of the preceding claims, in which the axial distance (d1 + d2) between two consecutive points (P_M) of maximum diameter of the profile is at least equal to 1 mm and in which the axial distance (d1 + d2) between two consecutive points (Pm) of minimum diameter of the profile is at least equal to 1 mm.

17. A threaded connection according to one of the preceding claims, in which said radial interference fit is substantially constant from one rib to the other.

18. A threaded connection according to claim 17, in which said radial interference fit is about 0.4 mm in diameter for a nominal threaded element diameter of 177.8 mm.

19. A threaded connection according to one of the preceding claims, in which said transfer surfaces (5, 6) are in mutual metal/metal sealing contact.

20. A threaded connection according to one of claims 1 to 18, in which a sealing material in the form of a coating or of an added ring is interposed between the metal surfaces of the male and female elements in the transfer zone.

21. A threaded connection according to one of the preceding claims, in which the male and female transfer surfaces (5, 6) or their envelopes form part of tapered surfaces.

22. A threaded connection according to one of the preceding claims, in which the transfer surfaces or their envelopes are inclined with respect to the axis (A) of the connection by an angle comprised between 0.5 and 5°.

23. A threaded connection according to one of the preceding claims, in which said undulated surface (5) has a roughness Ra at most equal to 3.2 micrometers.

24. A threaded connection according to one of the preceding claims, in which said transfer zone is axially disposed between said threaded portions (3, 4) and the free end (15) of the female element.

25. A threaded connection according to claim 24, in which the male transfer surface (5) is adjacent to the regular portion of a great length tube (11) at one end of which the male tubular element is formed.

26. A threaded connection according to claim 24 or claim 25, dependent on claim 5, in which said undulated surface (5) and said smooth surface (6) form part of the male (1) and female (2) elements respectively.

27. A threaded connection according to one of claims 24 to 26, in which the outer peripheral surface (14) of the female element has a depression (13) which locally reduces its external diameter facing the transfer zone (5, 6).

28. A threaded connection according to claim 27, in which said depression (13) has an axially extending concave curvilinear profile facing the transfer zone (5, 6) and either side thereof, said external diameter being minimal (Dm) substantially facing a median point (P) of the transfer zone and increasing progressively to either side of said point.

29. A threaded connection according to claim 28, in which said curvilinear concave profile is connected to a chamfer (16) adjacent to the free end (15) of the female element.

30. A threaded connection according to claim 28 or claim 29, in which said minimum external diameter (Dm) is such that the bending inertia of the female element in the plane of said minimum diameter is at least equal to the product of the bending inertia IZZ of the regular portion of a great length tube (11) at one end of which the male tubular element is formed and the fraction f of the bending moment to be transferred.

31. A threaded connection according to one of claims 28 to 30, in which said concave curvilinear profile has a radius of curvature of at least 50 mm and preferably at least 100 mm.

32. A threaded connection according to one of the preceding claims, in which the female element (2) forms part of a short coupling (12) each end of which is provided with a female threaded element which can receive a male threaded element forming part of a great length tube (11) for connecting the two tubes.

33. A process for improving the resistance to fatigue of a threaded tubular connection subjected to dynamic bending loads, said connection comprising a male tubular element (1) with a male threaded portion (3) and a female tubular element (2) with a female threaded portion (4), characterized in that the connection comprises at least a transfer zone axially located between said threaded portions and the free end of one of said tubular elements while being axially spaced from said threaded por-

tions (3, 4) so as to transfer from one element to the other element a fraction at least equal to 20 % of the bending moment undergone by the connection, the male and female elements (1, 2) having in said transfer zone respective transfer surfaces (5, 6) which are in mutual contact and interfere radially, one at least (5) of the transfer surfaces comprising means (7) suited for radially spacing the contact locations of the section where the stresses applied to the connection run.

34. A process according to claim 33, in which said means are in the form of a series of rounded annular ribs (7).